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Response of thunderstorm activity in data of neutron monitoring at Tien Shan

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We present results of the study of data of the monitoring of high-energy and thermal neutrons at Tien Shan at different stages of thunderstorm activity. The data of the neutron monitoring were used taking into account the barometric effect. The intensity of the neutron component of cosmic rays is recorded in seven energy ranges. The electric field has values of $\sim$ 100 V/m under fair weather conditions. Standard deviation of minute values of the neutron monitor data at the high altitude station does not exceed 0.5-0.6 %. Found that the standard deviation of the data during thunderstorms always exceeds these values.
We selected events during the passage of thunderstorm clouds over the high altitude station without lightning discharges or with a small number of them. It was found that the particle rate of the neutron monitor changes in antiphase with the electric field changes. Atmospheric electric field of positive polarity decreases the count rate of the neutron monitor, and negative polarity – increases. Change of the count rate occurs at values of electric field $\geq$ 10-15 kV/m and reaches 2 %. The neutron monitor at the high-altitude station has the ability to measure the energy of recorded particles through determination of their multiplicity. We experimentally established that the sensitivity of the detected particles to change in Ez increases with decreasing their energy. The upper energy threshold of sensitivity of neutrons to change electric field is $\sim$10 GeV. The physical mechanism of effect is based on lead nucleus capture of soft negative muons with the subsequent generation of neutrons. It is known that 7% of the neutron monitor count rate caused by negative muons. Absence of this effect in thermal neutrons data confirms the conclusion since the main difference of the thermal neutrons detector from the neutron monitor is the absence of the lead.
In the active phase of a thunderstorm in the formed thundercloud the picture of distribution of charges is complex and multilayered. The field on the ground can essentially differ from the field that caused the acceleration or deceleration of negative muons. It is possible the occurrence of the nuclear processes caused by lightning, - all this complicates interpretation of the monitor data. However, together with the system of electric field detectors, the neutron monitor allows to expand possibilities for determining the structure of thunderclouds. Recorded at the Tine Shan, as well as at other stations, bursts of both slow and fast neutrons during lightning discharges attract undoubted interest. However, their nature is still discussed.